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LAND CLASSIFICATION AS A BASIS FOR LAND APPRAISAL AND EQUALIZATION OF TAX ASSESSMENTS

Report on the Land Classification Study in Nevada Township, Story County, Iowa

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by

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FOREWORD

In the past few years an increasing amount of attention has been given to the categorical treatment of land areas under the general term "land classification". Both as to objectives and as to form, the procedures which have been included under this name have been very diverse.

The very great diversity of form and features, which are necessary to meet the different purposes which land classification may serve, leads to the inference that there is no one type of land classification which serves equally well all possible purposes, or answers all questions which, on occasion, need to be answered concerning the differential treatment of land. Hence, almost any land classification will logically be undertaken to serve some stated purpose or purposes, and to answer certain specific questions.

The following paper describes a method of land classification which was undertaken primarily to provide a basis for making more equitable appraisals of farm land for loans, and for tax assessment. Undertaken to serve a specific purpose, it differs materially from types of land classification undertaken to serve other purposes.

The usefulness of the procedure in serving its stated purposes depends upon the validity of certain assumptions, namely that equitable tax assessment should bear a close relationship to the earning power of the land under average management, and that the productivity of land, as measured by its output per acre in feed units is, within an area where inputs are approximately equal, a fairly good index of land values and earning capacity.

The statement that this procedure was devised to meet conditions in Iowa leads to the inference that the conditions in Iowa, which require land classification, are primarily those of land appraisal and tax assessment.

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LAND CLASSIFICATION AS A BASIS FOR LAND APPRAISAL AND EQUALIZATION OF TAX ASSESSMENTS 1/

A Method of Land Classification Suitable for Conditions in Iowa

This study was made with the primary purpose of developing and testing a method of economic land classification which would be suitable for use under conditions in Iowa and similar regions of the Corn Belt. A number of land classification studies have been made in other parts of the United States using several different types of approach. It seems, however, that the methods used in these studies, with the possible exception of those employed in a study made in North Dakota 2/, are not suitable under conditions existing in Iowa and in most of the strictly agricultural regions of the Corn Belt. The purpose of these studies has been to classify land into certain general use-districts, such as arable farming, forestry and recreation Such classifications are very desirable and necessary in many parts of the United States. The need, however, for a broad system of land classification by which land is placed in these general use groups is practically non-existent, and of little practical significance in relation to the land-use problems of Iowa.

It may be safely stated that very little land in Iowa is not suitable for arable farming. Some small tracts of land in the State are publicly owned, and most of these are used for State parks. In many areas, however, very good and highly productive

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1/ This study was undertaken in cooperation with the Soils Subsection of the Iowa Agricultural Experiment Station. The Experiment Station furnished two field men who mapped soil types, slope and erosion. The Resettlement Administration furnished one field man who mapped present land use and farm boundary lines, gathered information on buildings and permanent improvements, and tabulated pertinent data from court house records. The project was under the supervision of the State and Assistant State Land-Use Planning Specialists. A similar study is now in progress on a larger scale, covering an entire county (Tama County). The author wishes to express special acknowledgement to W. W. Wilcox, of the Economics Department of Iowa State College, for valuable suggestions, and to Don Keene for handling the statistical part of the study.

2/ Kellog, Charles E., and Ableiter, J. Kenneth. A Method of Rural Land Classification, U. S. Department of Agriculture Technical Bulletin No.469.

land suitable for intensive cropping is located directly adjacent to much poorer, comparatively unproductive and highly erodible land adapted to less intensive cropping or to permanent cover such as pasture or woodlot. Some of this poorer land may be more suitable for forestry than for pasture, and should be kept in timber for the purpose of erosion control. Since these areas of land are small and irregular, and are generally interspersed between good agricultural land, their best use may still be within the farm enterprise. A system of land classification, adapted to such conditions, therefore, should segregate land according to degree of natural productivity or other pertinent criteria upon which systems of land appraisal, tax assessment and proper land use can be based.

Many farms in Iowa embrace various quantities of both good and poor land, the amount ranging from entirely good to entirely poor land. Furthermore, it is not out of the ordinary to have very good and very poor land in close association on individual farms. It might be expected, therefore, that these variations in quality of land may not be entirely accounted for when values are placed upon farms for purposes of taxation or for obtaining loans. There are many indications that poor land tends to be over-valued and good land under-valued, partly due to the close assciation of the various kinds of lands, and the relatively crude basis of assessment.

A classification system for land types in such association, and under the prevailing conditions of farm arrangement and size, will necessarily have to be in rather minute detail. The purpose of land classification under these conditions would be to arrange bodies of land according to their inherent capacity to produce crops, pasture, or timber under average systems of management. In making such a classification all pertinent physical features such as soils, slope, state of erosion, stoniness, drainage, and presence of alkali, gullies, waterways and other obstructions need to be taken into consideration.

The use to which land is put largely determines its production and value. Very fertile land would have less value as grass land than as corn land. The inherent producing power of land may, however, determine to some extent its use. When soils are very fertile and produce well, corn will no doubt be the major crop, should climatic conditions be favorable, but if fertility is low, grass crops will probably be used to the greatest extent. In general, it might be considered that most land is being used to the best immediate economic advantage, although this may not be the best use for a sustained level of productiveness of the land. For instance, the growing of corn yields the highest economic returns on many of the rolling areas of Marshall silt loam of western Iowa, but the continued growing of corn on these soils will tend to hasten erosion, and in time will, no doubt, result in a much lower level of production. It may not be expected that present yields will be maintained in every case, not only because of losses due to erosion, but also because of the removal of plant nutrients by crops and losses due to leaching.

On the other hand, some land may have a production potentially higher than it has under its present use. Very often very highly fertile soils which would be suitable for corn are situated adjacent to poorer soils suitable only for pasture so that their best use is as pasture land, even though they would have a higher value as corn land in another association. It might, therefore, be difficult to arrive at a judgment as to the productivity of land, since the use to which land is put and the fertility of the soil may change, resulting either in placing more value on land or in reducing its value. Since these factors are intangible and are subject to change, it would seem that the only possible alternative would be to consider actual rather than potential use and productivity of land in a basic land classification. It is necessary, therefore, to determine the use to which each class of land is put, and to rate it accordingly in order to arrive at a productivity rating. No attempt was made in this study to determine what should be the proper use of the various classes of land. This method of land classification may, however, furnish a basis for such recommendations. It is interesting to note that the Soil Conservation Service now uses similar surveys in determining land use, and as a basis for recommended land-use adjustments. They do not attempt to assign productivity ratings in their work.

General conditions of land use and association of land types existing in Iowa were considered in selecting the township for this survey. An attempt was made to launch this study in an area which would portray average conditions existing in the State. The land in the township selected varied from very good, non-erodible, and highly productive, to poor, very erodible and relatively unproductive land. The use of this land varied also, from intensive cropping on one hand, to pasture and woodland on the other, and varied somewhat with the type of land -- that is, good land was heavily cropped and poor land was used for pasture. This general rule, however, did not always hold, as some of the poorest land was sometimes intensively cropped and some of the better land was used for pasture. The various types of land in this township were not found in solid blocks but were well intermingled, some of the best land often being located adjacent to some of the poorest within the same farm unit or even in the same field.

The Field Surveys

Field work was started in the fall of 1935. Inclement weather set in sooner than was expected; consequently the field survey was completed for only half of the township. All mapping in this study was done on a four-inch-to-the-mile scale. It was thus possible to show infrequent areas one-half acre in size, and to map areas as small as an acre without difficulty. A scale of mapping which allows for so much detail is of particular advantage in a glacial terrain such as exists in this township, since it permits the showing of small areas of sometimes markedly different bodies of land which otherwise would have to be thrown in with larger groups, if a smaller scale of mapping were used. These small areas may be of an entirely different value and may have a very different range of production than the larger areas with which they need to be combined in a survey made on a much smaller scale. For instance, it was possible to show small areas of sandy soils on the four-inch-to-the-mile map, which would have been combined with much more productive loams and silt loams on a map drawn to a scale of one-inch-to-the-mile. It was possible to show finer distinctions in texture on the larger map than would have been possible had a smaller scale been used. Furthermore, when slope and erosion are mapped together with soil type, smaller areas and more numerous classes need to be shown than was done on former smaller scale maps. Larger scale mapping is no doubt necessary when other information, in addition to soil type, is shown on one map, to allow for all necessary division, more detail, and more symbols, but the scale which will need to be used will, of necessity, be governed by the amount of detail needed and the type of country being mapped.

The soils were mapped in this case as in the regular soil survey. Twenty types, including muck and peat, were mapped. Seven of these types were upland soils, eight terrace soils, and three bottomland soils. Textures in these types ranged from sandy loams through loams and silt loams to silty clays.

Present state of erosion was mapped in combination with soil type. Five classes of erosion were recognized:

1. no apparent erosion - normal soil depth;
2. slight sheet erosion - more than 75 percent of "A" horizon remaining;

3. moderate sheet erosion - 50 to 75 percent of "A" horizon remaining;
4. severe sheet erosion - 25 to 50 percent of "A" horizon remaining, and erosion of some "B" horizon in small areas;
5. very severe sheet erosion - less than 25 percent of "A" horizon remaining, and erosion of some "B" horizon in considerable areas.

The percentages of "A" horizon were mapped on the basis of the normal depth -- that is, the actual depth of the surface soil now in place was observed by the field men when they constructed their maps.

The use of these five erosion classes increased the classes from 20 soil types to 41 land classes. The amount of detail was thus practically doubled, although the number of soil types ordinarily would probably have been increased by mapping several shallow phases. This additional number could not have been more than four in this township.

The topography or slope was mapped in four classes:

A. level to undulating, 0-5 percent of slope;
B. undulating to rolling, 5-9 percent of slope. (Some erosion, but can be controlled for cultivated crops);
C. rolling to strongly rolling, 9-20 percent of slope. (Considerable erosion generally not controllable successfully for cultivated crops);
D. steeply rolling, over 20 percent of slope (too steep for cultivation).

An attempt was made to regulate the slope classes according to land use, as will be noted. In many areas another or fifth class will be necessary if the steep land is to be divided into use classes as between pasture or forestry, or between pasture that may be grazed without much limitation and that on which grazing must be rather restricted.

The use of these four slope classes increased the classes mapped from 20 soil types to 36 combination soil and slope classes. Here again the number of soil types would have been increased slightly in ordinary mapping by including several steep phases which, however, would not have been more than four additional.

Mapping the soil, erosion and slope in combination resulted in 58 separate land classes, almost three times as many as would have been mapped on an ordinary soils map.

Other physical features included continuous and intermittent natural drainageways, gullies which were large enough to interfere with farming operations, and very deep gullies. Marshy areas and spots of so-called "alkali" of any extent were also mapped. These features, except gullies, are generally carried on the ordinary soil map, but probably not in quite as great detail.

The present land use was mapped on separate field sheets using the same base map as was used in the mapping of the physical features. It was felt that the mapping would become too difficult if both physical features and land use were mapped at the same time, and were placed on one sheet. A matter of technique is involved here also, since in the physical survey the surveyors generally walk the forty-rod lines, and in the land-use survey it is necessary to follow fence and other lines which separate different types of land use.

Three major divisions of land use existed in the township covered by this survey -- namely, crop land including rotation pasture; permanent pasture; and woodland. All land which was in intertilled crops, grain crops, hay or pasture crops (such as clover, alfalfa or timothy) was mapped as crop or rotated land. The type of rotated crop was not designated, since that changes from year to year. Pasture land was mapped as tillable permanent pasture and permanent pasture not tillable. The latter was mapped in two grades, that with a good grass cover and that with a poor grass cover. Woodland pasture was mapped in three grades: thin timber stand and fair grass cover, medium timber stand and fair to poor grass cover, and heavy timber stand and poor grass cover. In addition, the mapping included woodland not pastured, waste land, and good grass cover not utilized. In cases where there was a very apparent misuse of land, such as where steep and badly eroded land was used for intertilled crops, this was indicated. The criteria mapped and the symbols used are shown in Table I.

Table 1. Criteria Mapped in Land Classification Survey
(with legend)

A. Physical features

- I. Topography
  - A. Level to undulating, 0-5 percent
  - B. Undulating to rolling, 5-9 percent (Some erosion but can be controlled for cultivated crops)
  - C. Rolling to strongly rolling, 9-20 percent (considerable erosion but cannot be controlled successfully for cultivated crops)
  - D. Steeply rolling, over 20 percent (too steep for cultivation)
- II. Erosion
  - 1. No apparent erosion -- normal soil depth
  - 2. Slight sheet erosion - more than 75 percent of "A" horizon remaining
  - 3. Moderate sheet erosion - 50 to 75 percent of "A" horizon remaining
  - 4. Severe sheet erosion - 25 to 50 percent of "A" horizon remaining, and erosion of some "B" horizon in small areas
  - 5. Very severe sheet erosion - less than 25 percent of "A" horizon remaining, and erosion of some "B" horizon in considerable areas
- III. Drainage and gullies
  - Continuous natural drains *
  - Intermittent drains *
  - Gullies interfering with farming operations **
  - Very deep gullies **
- IV. Alkali
- V. Gravel or stones interfering with farming operations
  - Swamp
- VI. Soils
  - 2. Webster silty clay loam
  - 12. Webster loam
  - 30. Webster silty clay
  - 14. Clarion loam
  - 39. Clarion fine sandy loam

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* Blue lines on map

**Red lines on map

Table 1 (continued)

21. Lindley fine sandy loam
35. Dickinson fine sandy loam
37. O'Neill fine sandy loam
29. O'Neill loam
54. Buckner loam
24. O'Neill sandy loam
51. Judson fine sandy loam
31. Waukesha loam
26. Sarpy fine sandy loam
18. Wabash loam
28. Wabash silty clay loam
58. Wabash fine sandy loam
M. Muck
P. Peat

B. Cultural features

I. Use of farm land

C.	Crop land
W.P. 1	Woodland pasture - thin timber stand, fair grass
W.P. 2	Woodland pasture - medium timber stand, fair to poor
W.P. 3	Woodland pasture - heavy timber, poor grass
P.P. 1	Permanent pasture - good grass cover
P.P. 2	Permanent pasture - fair grass cover
T.P. P.	Tillable permanent pasture
W.	Woodland not pastured
1	Apparent misuse of land
Wa.	Waste
Wa.P.	Good grass cover not utilized

The Soils of Nevada Township

Soils of the Clarion series were the predominating types in Nevada Township. Most of the Clarion soils were loams, although there were some areas of Clarion fine sandy loam. These soils are upland prairie types and were derived from glacial drift. The surface soil of the Clarion loam is a very dark grayish-brown friable loam extending to a depth of 12 to 15 inches, and the fine sandy loam is a brown to dark brown fine sandy loam extending to a depth of 10 inches. Between these depths and about 20 inches there is a layer of yellowish-brown silty clay loam. The subsoil is a brownish-yellow or yellow friable silty clay loam or silty clay.

These soils are gently rolling to strongly rolling in topography, the slopes ranging from about 3 to 20 percent or more. All stages of erosion occurred on these soils in this township, and ranged from slight sheet erosion with more than 75 percent of the surface soil remaining, to very severe sheet erosion with less than 25 percent of the surface soil remaining. Most of the Clarion soils are used for cultivated crops, although some of the steeper and more sandy areas are used for pasture.

Soils of the Webster series are of secondary importance in this township. The Webster loam was the most important type of this series, followed in order by Webster silty clay loam and silty clay. These soils are also upland prairie types, and were derived from glacial drift. The surface soil of the Webster loam is a very dark grayish-brown or almost black, heavy friable loam, 12 to 14 inches deep. The surface soils of the silty clay loams and silty clays are darker in color and contain more clay. The subsurface of these soils is a very dark grayish-brown to black loam or tenacious silty clay. The topography of the Webster clay or silty clay loam is level to depressed, and of the Webster loam, level to very gently undulating. All slopes were less than 5 percent and very little erosion had occurred.

Some areas of Dickinson fine sandy loam occurred in Nevada township. This soil is an upland prairie type also derived from glacial drift. The surface soil of the Dickinson fine sandy loam is a dark brown fine sandy loam to a depth of 10 inches. Below this point and to a depth of 16 to 18 inches the soil is a brown, more compact loam. The subsoil is a loose porous sand or sandy loam. In topography the type is rolling, the slopes ranging from 5 to 20 percent or more. Erosion is more or less severe on this type, since most of it is in the upper slope brackets. Some of the Dickinson fine sandy loam is used for crops, although its most suitable use is for pasture.

Considerable areas of Lindley fine sandy loam occurred along the drainageways of this township. This soil is an upland timber type also derived from glacial drift. The surface soil of the Lindley fine sandy loam is a loose grayish-brown fine sandy loam to a depth of 8 to 10 inches. At this point there is a yellowish-brown loam or sandy loam extending to 24 or 30 inches. The subsoil varies from a loose sand to a sticky sandy loam. In topography the Lindley fine sandy loam is gently rolling to steep. Some 5 percent slopes were mapped, although most of them were more than 10 percent, and some as high as 30 and 40 percent. Most of the Lindley fine sandy loam is used for pasture, although some of it was cropped to corn and even soybeans. Erosion is severe when this type is cultivated. Crops do not yield high on the Lindley fine sandy loam.

The O'Neill soils occur as terrace or second bottom types. Three textures were mapped in the area studied, loam, sandy loam and fine sandy loam. The surface soils of these types are dark brown to black loams, sandy loams, or fine sandy loams to depths of 8 to 12 inches. The subsurface soils are dark brown mellow silt loams to sands. The subsoils are variable sandy gravelly loams. The topography of the O'Neill soils is generally level with some sloping areas. Little erosion occurs on them. Crop yields are fair.

Three other terrace soils occurred in Nevada township as very minor types. These were Waukesha loam, Judson fine sandy loam and Buckner loam. The surface soil of Waukesha is a dark grayish-brown mellow silt loam and the subsoil a friable silty clay loam. The surface soils of the Buckner and Judson range from loam to fine sandy loam and the subsoils range from sandy loam to sand.

The Wabash soils are the most extensive bottomland types in Nevada township. The textures mapped were loam, silty clay loam and fine sandy loam. The surface soils of these types are very dark grayish-brown or almost black to depths of 10 or 12 inches. The subsoils are dark or black silty clays to depths of 24 to 30 inches and are underlaid by dark-gray plastic clays. The Wabash soils are level to depressed and not subject to erosion. They are mostly in pasture in this township.

Small areas of Sarpy fine sandy loam were mapped in Nevada township. This is a bottomland type, the surface soil of which is a uniform light brown fine sandy loam. The subsurface is a lighter brown fine sandy loam and the subsoil a light yellowish-brown sand. This type is used principally for pasture.

Small areas of peat and muck also occur in Nevada township. Both are relatively unproductive and are used for pasture whenever possible.

Establishing Productivity Ratings

Assigning yields and productivity ratings to land classes is rather difficult, due to the fact that existing yield data are not sufficiently refined to be directly applicable to land classes mapped out in such detail as was done in this survey. Perhaps the most extensive yield data in Iowa are those reported by farmers to assessors when they gather the annual crop and farm statistics for the weather and crop bureau. These statistics are reported according to farm units, however, and not for specified tracts of land. That is, the acreage and the total yield of each crop grown on each farm is reported.

Yields for the various land classes, therefore, had to be established deductively. Various persons who were familiar with the several land classes estimated the yield of corn, oats and pasture which would probably be obtained under average management on the various types of land. These estimated yields for specific land types were combined into a weighted average for the total crop land of the individual farms, and were checked against the yields on the respective farms as reported by assessors for the crop and farm statistics.

A wide variation occurred between the estimated production and the reported production of a considerable number of the farms. This variation no doubt is partly due to differences in managerial ability. When the estimated production was compared, however, with the reported production of a considerable number of farms or with the production of that part of the township completed in this survey, there was a substantial agreement, indicating that the initial yield estimates for land classes correspond fairly close to reality.

The yield of crops for the various classes of land was estimated in terms of bushels per acre in the case of corn and oats, and in terms of carrying capacity in the case of pasture land. In order to place these on a comparable basis, it seemed best to tanslate the yields into terms of feed units. Using corn as a standard, one bushel of which would equal one feed unit, a bushel of oats would equal .43 feed units. In the case of pasture land, calculations were based on the assumption that when one acre would support one cow during one grazing season, the value of the grass on that acre would be equivalent to 38.7 feed units.

The conversion of various crops into feed units as a common denominator seems to be satisfactory, although admittedly weak in many respects. A certain grain can easily be translated into corn equivalents for certain types of livestock, but would be different for other types. Further research needs to be done by animal husbandry specialists to perfect existing methods of conversion, but for this work present conversion methods were felt to be fairly reliable.

The common rotations which are likely to be used on the various land classes were arrived at in a manner similar to that used in arriving at the yields. In checking over the crop and farm statistics, it was found that the crop rotations followed in this township vary somewhere between a corn-corn-oats, and a corn-oats rotation. The acreage of alfalfa and red clover in this township was found to be insignificant.

Productivity ratings were arrived at in the case of crop land by applying the estimated feed unit producion to the estimated rotation. For example, it was estimated that level Webster loam with no erosion would yield 55 bushels of corn and 45 bushels of oats per acre, and that a three-year rotation of corn-corn-oats was being followed. Translated into feed units, this land would produce 110 units of corn and 19.4 units of oats, a total of 129.4 units during the three-year rotation, or 43.1 feed units annually. In the case of pasture land, carrying capacities are directly translatable into feed units. (See Table 2 for productivity ratings according to land classes.)

It should be mentioned that these are exploitive rotations now in common use on these soil types. In arriving at a "sustained productivity" rating, soil conserving rotations should be assumed. This very important refinement remains reserved for a later phase of this study.

Assembling the Data

The data were assembled for analysis by transferring all the information from the land classification map to tracing cloth on which were also drawn boundaries of ownership tracts obtained from court house records. The transparent tracing was then placed over the land-use map and the area of each land body measured with a planimeter and tabulated according to land use, tracts of land which are divided for assessment purposes, and individual farm units. By applying productivity ratings to the measured land classes, an average per acre productivity rating was obtained for each tract of land and for each farm.

Table 2. Productivity Ratings

Soil Type	Class	Productivity Ratings 1/	
		Crop Land	Pasture Land
Webster silty clay loam	2A1	39.1	38.7
Webster loam	12A1	43.1	38.7
	12A2	41.5	38.7
Webster silty clay	30A1	24.3	30.5
Clarion loam	14A2	36.5	38.7
	14A3	32.9	30.5
	14B3	29.1	25.8
	14B4	26.3	21.5
	14C4	18.3	16.8
	14D4	12.9	12.1
	14D5	8.8	8.5
Clarion fine sandy loam	39A2	29.1	25.8
	39A3	23.0	21.5
	39B3	20.0	21.5
	39B4	18.4	16.8
	39C3	15.8	16.8
	39C4	14.4	12.1
	39C5	10.3	8.5
	39D4	5.6	5.0
	39D5	4.6	5.0
Dickinson fine sandy loam	35A3	20.0	21.5
	35B4	16.4	16.8
	35C4	12.9	12.1
	35C5	10.3	8.5
	35D4	4.6	5.0
	35D5	4.6	5.0

1/ Productivity ratings are expressed in terms of average feed units produced per acre under present land-use patterns. The feed value of corn stalks and ears left in the field has not been included in the above ratings -- this amounts roughly to 3 to 5 feed units per acre -- nor has the feed value of oats straw been taken into account. This should be kept in mind in comparing the crop land with the pasture land ratings of the same land class.

Table 2. (Continued)

Soil Type	Class	Productivity Ratings	
		Crop Land	Pasture Land
Lindley fine sandy loam	21A2	20.0	21.5
	21A3	18.4	16.8
	21B3	16.4	16.8
	21B4	14.4	12.1
	21C3	12.2	12.1
	21C4	10.3	8.5
	21C5	8.2	8.5
	21D4	4.6	5.0
	21D5	4.6	5.0
O'Neill loam	29A1	29.1	30.5
	29A2	25.4	25.8
	29C4	9.5	8.5
	29D4	4.8	5.0
O'Neill fine sandy loam	37A1	25.7	21.5
	37A2	21.7	21.5
	37A3	18.1	16.8
	37C4	9.5	8.5
	37D5	8.1	8.5
O'Neill sandy loam	24A1	21.0	21.5
	24A2	17.3	21.5
	24A3	14.0	12.1
Waukesha loam	31A2	36.5	38.7
Judson fine sandy loam	51A1	33.1	30.5
	51A2	29.1	30.5
Wabash loam	18A1	39.8	38.7
Buckner loam	54A2	-	25.8
Wabash silty clay loam	28A1	35.7	30.5
Wabash fine sandy loam	58A1	29.1	25.8
Sarpy fine sandy loam	26A1	14.3	12.1

Table 2. (Continued)

Soil Type	Class	Productivity Ratings	
		Crop Land	Pasture Land
Muck	-	8.4	8.5
Peat	-	8.1	8.5

Productivity ratings for all heavily timbered classes -- 3.8

The Problem of Equalization of Tax Assessments

It is obvious that such a system of land classification as this could be of particular value for several purposes. It could be used as a basis for equitable tax assessments and for establishing a permanent appraisal base for mortgage loans and land transfers. This system may be of value also as a principal criterion for determining correct land use. It should be valuable as an aid in determining where the settlement of additional persons should be discouraged, and in delineating areas in which closer settlement might not be undesirable.

In the present study the equitableness of present tax assessments has been scrutinized in the light of the results of this land classification.

The methods used by Iowa assessors in placing values on property for assessment are rather inflexible and result in many discrepancies. Values as placed by them are often far out of line on similar properties, and do not show enough differentiation between dissimilar properties. A per acre value is placed on land largely on the basis of the possible return which that land would bring if sold. Values placed on buildings by the assessors seem to reflect only to a very slight extent the actual value of the buildings. Work sheets prepared by the State Tax Board to enable assessors to arrive at an equitable evaluaion for tax assessments of both land and buildings were not used to advantage. Had these schedules been used, evaluations might have been more equitable. The discrepancies in tax assessments may also vary with townships since the assessors are elected, and since the personal element enters in. It was found that the assessor who had held office in the township in which this survey was made had attempted to assess all properties equitably; consequently the discrepancies may not have been as great as in some other township.

The contention that the evaluation of land, for whatever purpose, should be governed by its productivity or producing power is generally accepted. 3/ It would seem only logical that tax assessments on land should be in accordance with the earning capacity of that land or its ability to pay. When not thus regulated, taxes may be so high that the poorest land is forced into the most exploitive use, thereby creating serious land-use maladjustments, or too low in the case of good land, considering its capability of carrying a larger share of the tax burden.

Tax assessments in this particular township seem to follow somewhat the productivity of the land. This may be true in this township to a greater extent than would be true in many others because of the special attempt of the assessor to assess all properties equitably. Data obtained in this study were analyzed graphically and statistically in an attempt to find the exact relationship between productivity and values placed on the land for taxation purposes. Due to the fact that productivity ratings represent a rating for land only, and assessments for taxation purposes include both land and building values, all the data were analyzed by making two comparisons. In the first, the per acre productivity ratings of farms were compared with the per acre assessed valuations as placed on those farms by the assessors. In the second, the per acre productivity ratings of farms were compared with the assessed valuations placed by the assessors and adjusted for the value of the buildings which should have been placed on the farm. In the first case the building value is at least partly included in the assessed value; in the second case the building value has been taken out of the assessed value to obtain the value of the bare land. In both cases there seemed to be a fair relationship between productivity ratings and assessed values. That is, when the productivity of the land increased, the valuation placed on that land by the assessor tended to increase also. It appears, however, that the assessor disregarded the value of the buildings to a large extent when he placed his values, since the assessments did not follow nearly as well the productivity ratings when an adjustment had been made for buildings as when no adjustment had been made.

These tendencies are well illustrated in Chart I, which shows the productivity rating and total assessed value in percent of average for the sixty-one individual farms studied in this township, and in Chart II, which shows the productivity ratings compared

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3/ See Murray, W. G., and Meldrum, H. R. "A Production Method of Valuing Land", Iowa Agricultural Experiment Station, Bulletin 326.

with the assessed value corrected for the value of the buildings -- that is, the assessed value of the bare land. By arranging the farms in the descending order of magnitude of the productivity ratings, it becomes apparent that there is some correlation of productivity with assessed values. (Chart I.) It becomes apparent also, however, that farms of more than average productivity are assessed only slightly higher than the average, and those of less than average productivity only slightly less than the average. Wide variations may also be noted. Several farms of less than average productivity carry assessments higher than those of average productivity, and a number of farms of high productivity carry assessments lower than do those of average productivity. When the assessed values are adjusted for building values with the result representing the value of the bare land, even wider variations are apparent. (Chart II.)

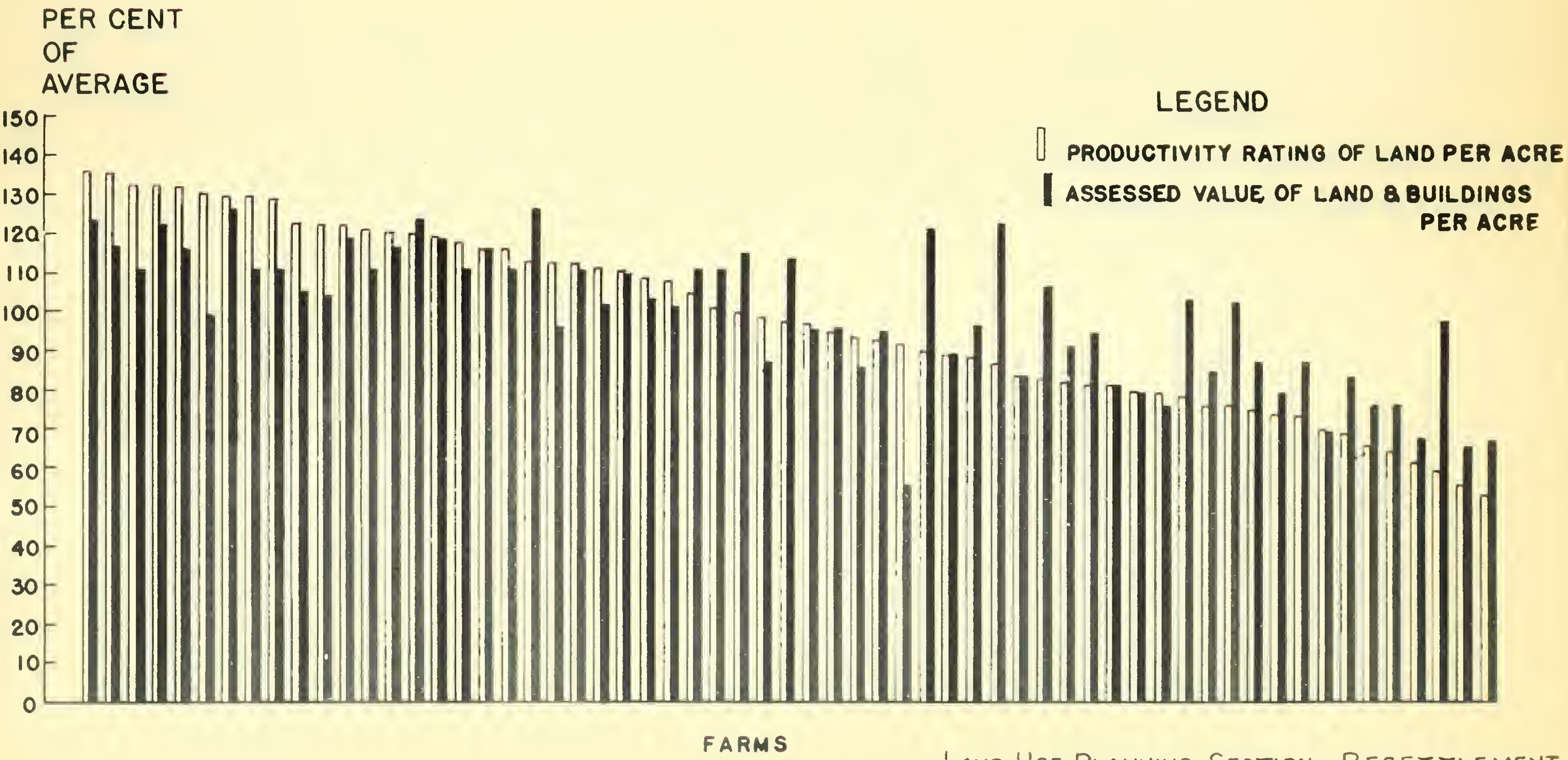
The relationship of productivity ratings to assessed valuations of land and buildings, and the relationship of productivity ratings to assessed valuations of the land only are shown in scatter-diagrams, Charts III and IV. The tendency of tax assessments to follow the productivity of the land is apparent in these diagrams. It is apparent, also, that this tendency is relatively weak and does not operate equitably.

Statistical measurements also bear out these contentions. The correlation between land productivity and assessed value of land and buildings is expressed by a coefficient of .660; and when the assessed value was adjusted for building value, thus representing only land, the correlation is expressed by a coefficient of .579. A coefficient of 1 would indicate a perfect correlation. These correlations may be considered significant, although not highly so. The degree of association between assessed land values and productivity ratings ranges from poor to fair.

A study of the scatter or dispersion of the paired data indicates that there is a wide scatter about the mean or average. When there was no adjustment made for building values, the standard deviation of the assessed value (y) was 9.22 and of the productivity rating (x) was 6.45. The mean of y was 52.56 and of x was 27.47. Two-thirds of all assessed values, therefore, fell between the range of \$43.34 to \$61.78, and two-thirds of all productivity ratings fell between 21.02 and 33.93 feed units.

CHART I. RELATION OF PRODUCTIVITY RATING TO ASSESSED VALUE OF LAND AND BUILDINGS ON INDIVIDUAL FARMS

61 FARMS - NEVADA TOWNSHIP - STORY CO., IOWA



Land Use Planning Section, Resettlement Administration, and Agr. Exp. Sta.
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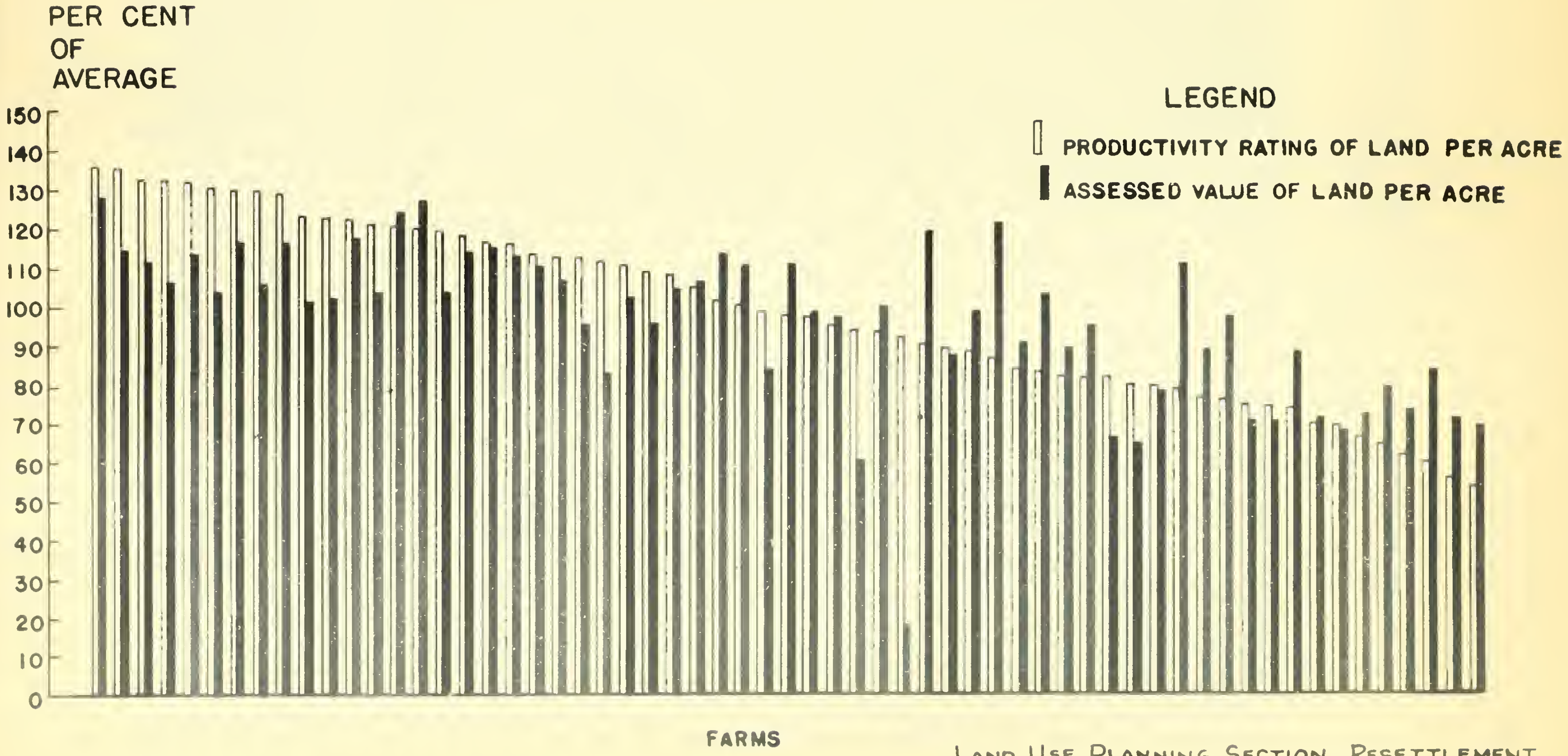
CHART II. RELATION OF PRODUCTIVITY RATING TO ASSESSED VALUE OF LAND ON INDIVIDUAL FARMS

61 FARMS - NEVADA TOWNSHIP - STORY CO., IOWA



Land Use Planning Section, Resettlement
Administration, and Agr. Exp. Sta.
Iowa State College Cooperating

CHART III

CORRELATION OF PRODUCTIVITY RATING WITH ASSESSED VALUE OF LAND AND BUILDINGS

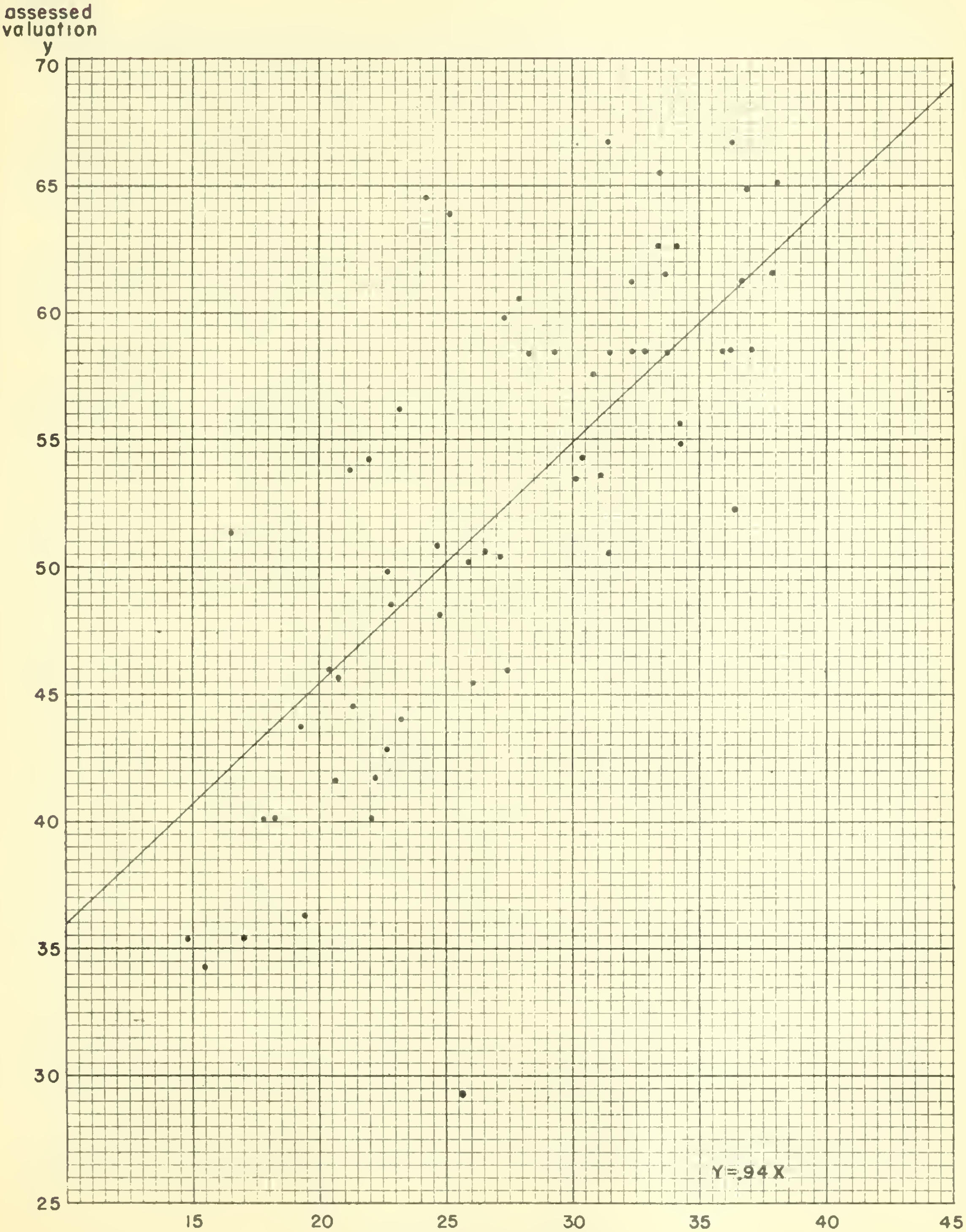
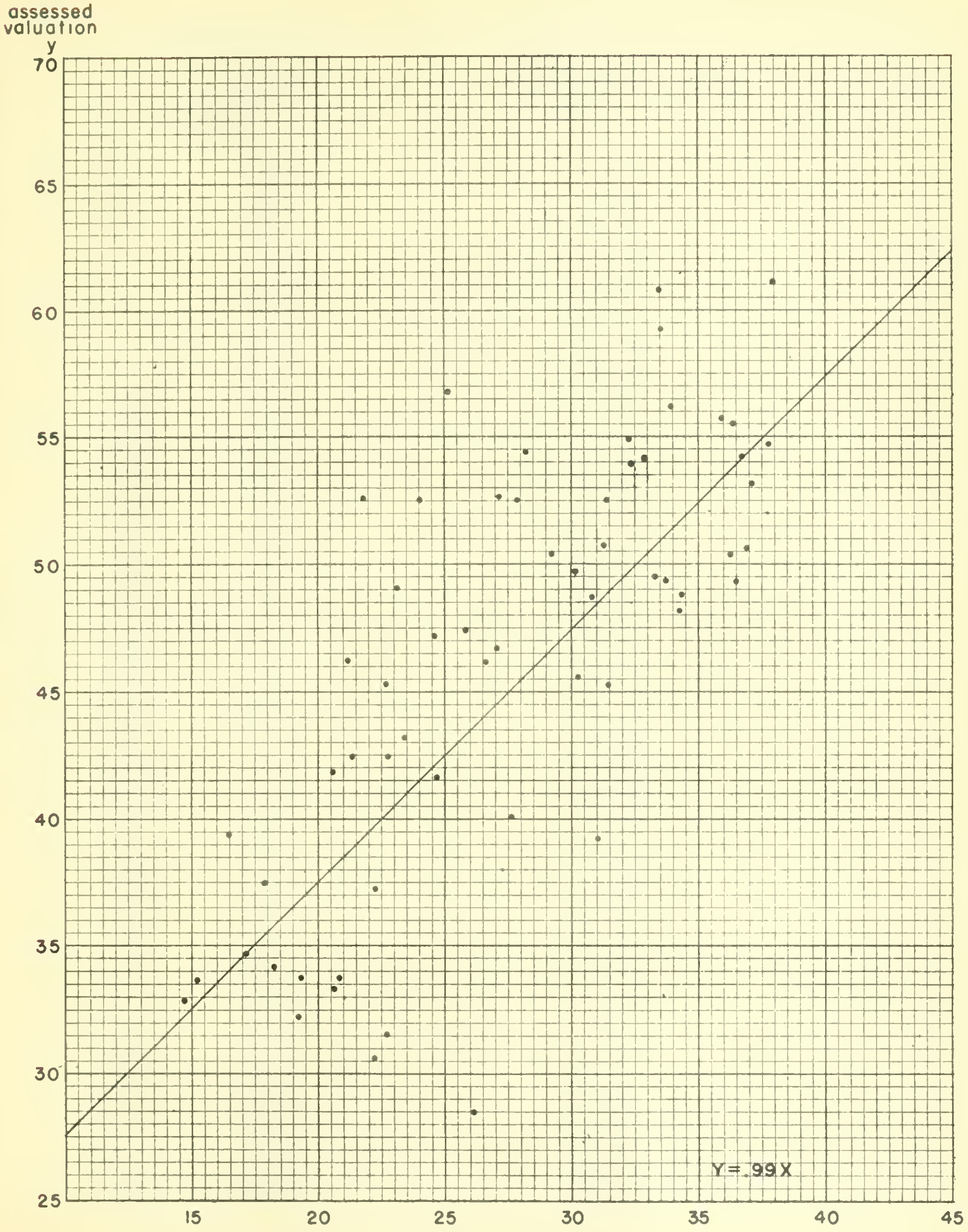


CHART IV

CORRELATION OF PRODUCTIVITY RATING WITH ASSESSED VALUE OF LAND



PRODUCTIVITY RATING X

(One observation omitted; x = 25.5; y = 8.4)

Table 3. Productivity Rating, Assessed Value of Land and Buildings and of Land for Individual Farms

(Productivity rating in ascending order of magnitude)

	Productivity Rating Per Acre	Assessed Value of Land and Buildings Per Acre	Assessed Value of Land Per Acre
1.	14.8	35.31	32.88
2.	15.4	34.28	33.69
3.	16.5	51.43	39.53
4.	17.1	35.44	34.83
5.	17.9	40.09	37.61
6.	18.3	40.12	34.31
7.	19.2	43.85	32.39
8.	19.4	36.34	33.93
9.	20.5	45.95	41.99
10.	20.6	41.75	33.50
11.	20.8	45.80	33.62
12.	21.1	53.88	46.31
13.	21.2	44.65	42.38
14.	21.9	54.34	52.76
15.	22.1	40.11	37.17
16.	22.2	41.81	30.81
17.	22.7	42.94	31.50
18.	22.7	49.90	45.26
19.	22.8	48.61	42.52
20.	23.1	56.34	49.11
21.	23.3	43.99	43.15
22.	24.1	64.80	57.84
23.	24.6	50.95	47.18
24.	24.8	47.05	41.60
25.	25.1	64.03	56.89
26.	25.6	29.25	8.42
27.	25.9	50.21	47.49
28.	26.1	45.39	28.65
29.	26.5	50.73	46.37
30.	27.0	50.44	46.91
31.	27.2	59.90	52.79
32.	27.4	45.97	40.00
33.	27.9	60.71	52.73
34.	28.2	58.52	54.06
35.	29.2	58.52	50.58
36.	30.1	53.50	49.81
37.	30.3	54.41	45.64

Table 3. (Continued)

	Productivity Rating Per Acre	Assessed Value of Land and Buildings Per Acre	Assessed Value of Land Per Acre
38.	30.8	57.71	48.31
39.	31.0	53.68	39.23
40.	31.4	50.60	45.38
41.	31.4	58.52	50.92
42.	31.5	66.83	52.67
43.	32.4	61.42	54.96
44.	32.4	58.52	54.07
45.	32.9	58.52	54.34
46.	33.3	62.70	49.50
47.	33.5	65.46	60.84
48.	33.6	61.53	59.17
49.	33.8	58.52	49.51
50.	34.1	62.70	56.11
51.	34.2	54.99	48.79
52.	34.3	55.57	48.40
53.	36.0	58.52	55.74
54.	36.2	58.52	55.52
55.	36.2	66.88	50.43
56.	36.4	52.31	49.47
57.	36.8	61.29	54.17
58.	36.9	64.76	50.71
59.	37.0	58.52	53.26
60.	37.8	61.65	54.72
61.	38.0	65.18	61.13

When an adjustment was made for buildings so that the assessment represented only the value of the bare land, there was even a wider scatter. In this case the standard deviation of y was 11.02 and of x again was 6.45. The mean of y was 45.21 and of x again was 27.47. Two-thirds of all assessed values adjusted for buildings fell between $34.19 and $56.23.

Net regression lines (lines of best fit) were constructed to show the unit changes. When no adjustment was made for buildings, y equaled .94x; that is, a unit change in y or assessed value was accompanied by a change of .94 in x representing the productivity rating. When the assessed values were adjusted for buildings, y equalled .99x. The standard error of estimate, or the scatter about the net regression line, indicates that even though there is some correlation between assessed values and productivity, it would be difficult, knowing the productivity rating, to estimate the assessed value the assessor placed on a given farm. When no adjustment was made in the assessed values for the buildings, the standard error of estimate was 6.95; thus two-thirds of the cases will lie along the net regression line, within a range of 13.90 units. With a standard deviation of 9.22 and a standard error of estimate of 6.95 there was a decrease in scatter about the line of best fit from the scatter about the mean of only 24.6 percent. In order to be perfectly accurate in estimating the assessed value which was placed on a piece of land, given its productivity rating, this decrease would need to be 100 percent.

After an adjustment had been made for building values so that the assessed values represented only the value of the bare land, the standard deviation of y was 11.12; the standard error of estimate was 9.02; and the decrease in scatter about the line of best fit from the scatter about the mean was only 18.2. These figures indicate that although the assessor did place his assessed values somewhat according to the productivity of the land, the chances that they were equitably placed were very low, and the values of the buildings were probably insufficiently considered when the assessments were made.

It would seem from this study that the productivity of the land should receive more consideration, not only as a basis for tax assessments, but also whenever appraisal values are placed on land. An adequate system of land classification seems indispensable for use in achieving a reasonable degree of uniformity and equitableness in tax assessment and land appraisal. Tax assessments as now made are haphazard and generally far from equitable. Only a slight variation may be found as between tax assessments on poorly productive and highly productive lands. This study would indicate that if land is classified in enough detail so that variations in productivity may be detected, a basis for true and accurate tax assessments might be derived.

Several factors which may influence the value of land in some cases were not thought to be of significant importance in this township. In some sections of the country the distance to market and the type of roads will have a definite influence on the cost of marketing farm produce, and consequently on the value of the land. In this township, the variation in the distances to market was insignificant and all farms were located on all-weather roads. The size and arrangement of fields on farms may so affect costs of production on some large and irregularly shaped farms as to be important factors. Not enough variation in sizes and arrangements of fields existed in the township studied to influence materially the value of land. In some other areas such factors as stoniness, gullies, stumps, alkali and drainage will be of sufficient importance to influence production, and consequently land values. These factors did not appear often enough to be considered important in Nevada Township.

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